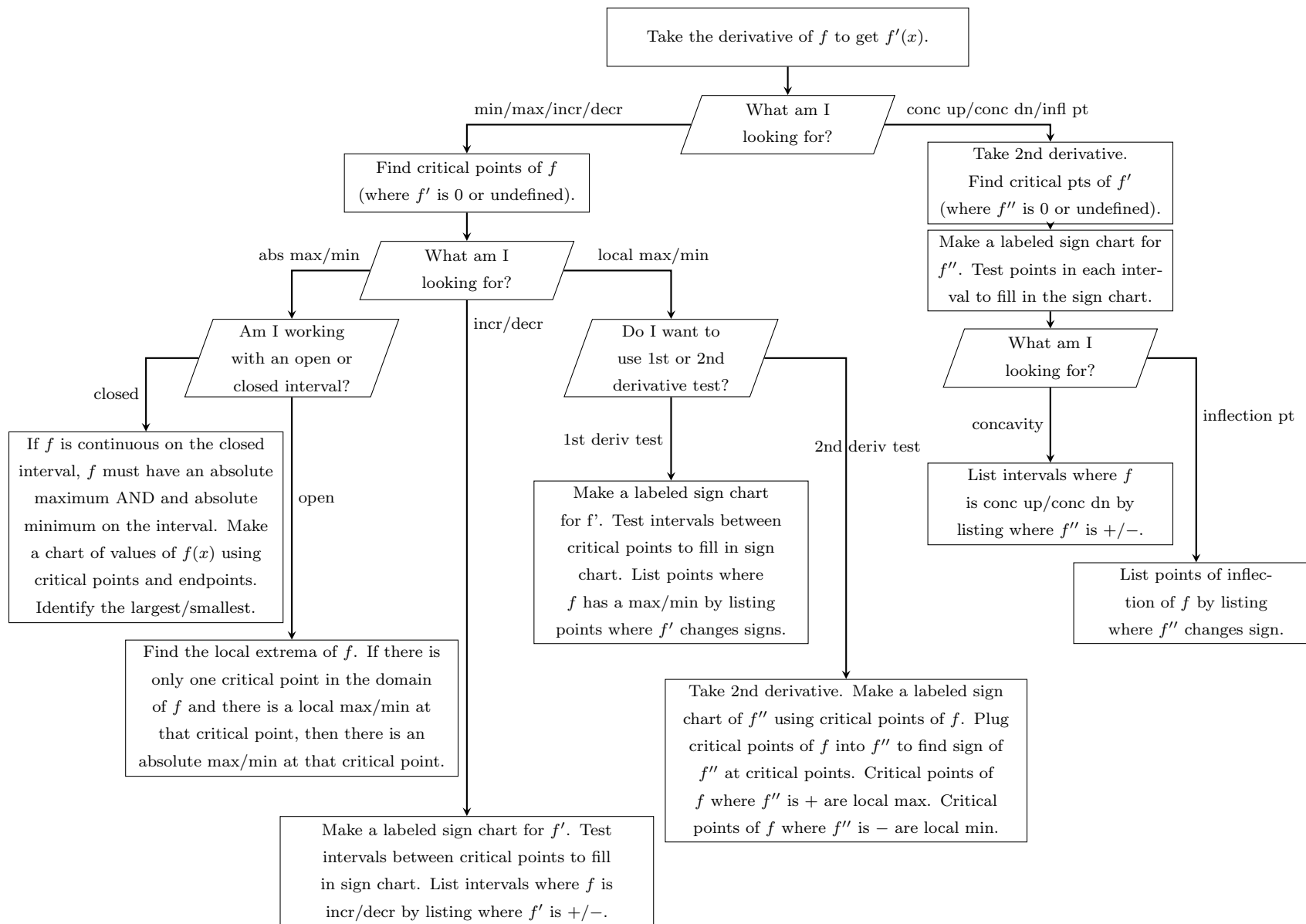Let $f(x)$ be a given function. This flowchart is useful for solving problems that involve finding the max/min of f, finding intervals where f is increasing/decreasing/concave up/concave down, and finding inflection points of f.

Take the derivative of f to get $f'(x)$.

What am I looking for?

min/max/incr/decr

conc up/conc dn/infl pt

Find critical points of f (where f' is 0 or undefined).

Take 2nd derivative. Find critical pts of f' (where f'' is 0 or undefined).

Make a labeled sign chart for f''. Test points in each interval to fill in the sign chart.

What am I looking for?

abs max/min

local max/min

incr/decr

What am I looking for?

concavity

inflection pt

Am I working with an open or closed interval?

closed

open

Do I want to use 1st or 2nd derivative test?

1st deriv test

2nd deriv test

List intervals where f is conc up/conc dn by listing where f'' is $+/-$.

If f is continuous on the closed interval, f must have an absolute maximum AND and absolute minimum on the interval. Make a chart of values of $f(x)$ using critical points and endpoints. Identify the largest/smallest.

Make a labeled sign chart for f'. Test intervals between critical points to fill in sign chart. List points where f has a max/min by listing points where f' changes signs.

List points of inflection of f by listing where f'' changes sign.

Find the local extrema of f. If there is only one critical point in the domain of f and there is a local max/min at that critical point, then there is an absolute max/min at that critical point.

Take 2nd derivative. Make a labeled sign chart of f'' using critical points of f. Plug critical points of f into f'' to find sign of f'' at critical points. Critical points of f where f'' is $+$ are local max. Critical points of f where f'' is $-$ are local min.

Make a labeled sign chart for f'. Test intervals between critical points to fill in sign chart. List intervals where f is incr/decr by listing where f' is $+/-$.

If a question asks WHERE the extrema are, make sure to include x values. If a question asks WHAT the extrema are, make sure to include y values.